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Title of
Invention: SYSTEM FOR CONTROLLING A VENTILATION SYSTEM

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System for Controlling a Ventilation System

Field of the Invention

The present invention is directed to the field of temperature control for homes, buildings and offices. In particular, the present invention is directed to a system for controlling the temperature of the individual rooms and spaces within a building, office or home.

Background of the Invention

The problem of controlling the temperature of individual rooms has been a frequent issue in homes, buildings and office buildings. Frequently, different locations of a home or office present different heating and cooling needs at different times of the day. For example, it is often desirable to cool the bedrooms of a house at night, while the temperature of the den or living room area may be of less significance. The increasing cost of energy coupled with the international situation has made it more important than ever to maximize energy conservation and efficiency.

Heretofore, the problem of controlling individual room temperatures within a building has been handled by a wide variety of systems. Some of the prior art systems have used a temperature controller which incorporates expensive switching mechanisms or the like and complex zone area controls. Some of these controls require extensive modifications to existing duct work or complicated HVAC systems. Such system have been difficult to adapt to older HVAC systems and beyond the reach of many consumers.

The patent literature has disclosed a variety of systems for controlling the temperature in homes and the like. U.S. Patent 4,997,030 to Goto entitled Central air conditioning system having remote controller in a plurality of rooms for starting or stopping air conditioning apparatus. Central air conditioning system includes an air conditioning apparatus having a system controller and a variable air volume controller having a damper which controls the amount of conditioned air fed from the air conditioning apparatus into each room to be air-conditioned. Each room is provided with a room remote controller for controlling the operation of the air volume controller. The room remote controller outputs a start/stop command signal to control the operation of both the air conditioning apparatus and the air volume controller. The temperature of conditioned air fed from the air conditioning apparatus is maintained at a prescribed value determined on the basis of the desired room temperature in each room.

Patent 4,086,781 discloses a variable air volume air conditioning system and is provided with thermostat controlled variable air volume terminal boxes for controlling the volume of constant temperature conditioned air provided to each space to be conditioned. The conditioned air is delivered through a short pressure recovery duct to a trunk duct by a centrifugal fan having forward curved blades. The trunk duct pressure is maintained substantially constant by control vanes disposed at the recovery duct outlet, said control vanes being responsive to an increase in duct pressure to close the duct outlet and unload the fan, thereby reducing the energy consumed by the fan. Economizer operation is provided by the use of return air dampers and outside air dampers controlled in

response to outside air temperature and air supply duct temperature to mix outside air and return air to reduce the amount of mechanical refrigeration required. A power air return means is provided for returning air to the system from the spaces that are conditioned and for controlling the amount of return air in accordance with the volume of air delivered to the conditioned spaces.

Patent 4,828,168 discloses a method for controlling duct-type air conditioning systems. A method of controlling a centralized or duct-type air predetermined control pattern which is selected in accordance with a desired level set by a temperature setter for each individual room.

Patent 4,836,096 discloses a variable air volume air distribution system, an improved variable air volume air distribution system for distributing air within the interior of a building. The variable air volume air distribution system includes an air supply plenum, a supply fan for transferring air from the air supply plenum into the interior of the building, a return air plenum for receiving air from the conditioned space of the building, and an exhaust fan for exhausting air from the return air plenum to the outside atmosphere. The improvement includes a first pressure sensor located in the air supply plenum for sensing the air pressure within the air supply plenum; a second pressure sensor located in the return air plenum for sensing the air pressure within the return air plenum; and a control structure for causing the exhaust fan to exhaust air from the return air plenum at a rate proportional to the ratio of the air pressure within the air supply plenum and the return air plenum.

As can be seen, each of the above systems is largely directed to a complicated or costly system. It would be desirable to provide a system which can easily control the temperature in a room, such as a bedroom or an office.

It would be particularly desirable to provide a temperature control system which is compatible with existing systems and duct work and which can easily be retrofitted into existing systems.

Objects and Summary of the Invention

It is therefore, an object of the present invention to control the operation of an air conditioning apparatus by a remote control unit in each room in a central air conditioning or heating system.

It is a further object of the invention to supply air-conditioned or heated air sufficient to control the temperature of each room to be air-conditioned or heated at each desired room temperature.

It is a further object of the present invention to provide a room temperature control system which can be retrofitted onto existing HVAC systems.

To accomplish the above-described objects, according to one embodiment of the present invention, a central air conditioning or heating system is provided wherein conditioned or heated air is supplied to a plurality of rooms to be air-conditioned or heated through a common duct system. The system includes a variable air vent control system, corresponding to each room, for controlling the flow of the conditioned air from vent duct into the corresponding room.

The system also includes a controller, which may be provided in each room, including an adjustment mechanism, wherein a command signal is output

there from to control the operation of the vent. In a preferred embodiment, the variable air volume control unit is affixed to the vent. A desired room temperature is established such that a desired room temperature is pre-stored and when the actual room temperature of the corresponding room is detected, the vent control is activated to control the room temperature by the controller. The room remote controller may include a mode selection function wherein either heating or cooling may be chosen.

A temperature detection thermostat is included wherein the actual room temperature of the corresponding room is detected, and where a command signal is output from the controller, pursuant to a program, to control the vents. The present invention may be operated via a wireless system and may also incorporate a centrally located system which controls a number of rooms.

These and other objects of the present invention will become apparent from the following detached descriptions.

Description of the Figures

Figure 1 is a block diagram of the present invention.

Figure 2 is a schematic diagram of the components of the present invention.

Figure 3 is an isolated view of the vent control system of the present invention.

Figure 4 is a block diagram of an alternative central temperature control for the present invention.

Detailed Description of the Invention

The present invention is described with reference to the enclosed Figures wherein the same numbers are utilized where applicable. The present invention is broadly directed to a system for controlling the temperature of a room or number of rooms, both for heating and/or air conditioning. The present invention is specifically directed to a system for controlling the temperature in a room. In particular, the present invention is directed to systems for controlling the temperature of specific rooms in a home or building.

The system in one embodiment may build upon existing technology and relies on the existing vents throughout the building. Vents in each room or area, open and close according to a pre-stored or pre-programmed profile for that room. The major objective of the invention is to match the desired set temperature for a particular area such as bedrooms at night while other areas can be set at a less costly temperature.

Referring to Figures 1, 2 and 3, the present invention, in a simplest embodiment incorporates three basic components; a controller; a vent control system and a thermostat system. The first element of the invention is a system¹² which facilitates the control of the vents ¹³ within the house, office or facility. As shown in Figures 2a and 2b, the vent control system ¹² comprises a small electric motor ¹⁴ which is attached to the applicable vent in each room to be controlled. The motor ¹⁴ through a mechanism such as a gear arm ¹⁶ facilitates precise movement of the vents to selectively control the outflow of air between fully open and fully closed.

The present invention thus relies upon the use of the existing vents and grills through out the building. Vents in each room/area are configured to open and close at specific levels and intervals, according to each individual room temperature and according to a pre-stored program so to maintain a preset temperature for that room. For example, at night while the house residents are sleeping, the living area, kitchen, guest room, and other areas not used at night, is set to 85 degrees. At the same time, the 3 bedrooms that the residents are sleeping in are set to 70 degrees. As soon as temperature in the not needed areas rises to 86 degrees, the automatic vents open (partially or completely) and stay open until the temperature lowers to 85 degrees. Simultaneously, if the bedroom temperatures dropped to below 70 degrees, the vents in those rooms would shut (partially or wholly) until the temperature increases to 70 degrees.

The second component of the invention comprises a controller 16. The controller 16 is a operational heart of the system. The controller can comprise part of a digital input system 18 which may be programmable. The controller in one embodiment comprises housing 19 having a processor 20, PROM or EPROM 22 and Input/Output 23. In one embodiment, the controller may include a digital readout display²⁴. PROM or EPROM 22 contain the operational programs used by the system.

Actuation buttons 25 permit the controller to be programmed and controlled to meet the temperature requirements of the room in which it is located. The controller can be set up so that the user inputs the desired

temperatures at the different times for the different areas. The controller sends signals (hard wired or wireless) to the vent motors to open and close.

Finally, in the preferred embodiment, the system further includes a thermostat 26 to determine the temperature of each room to be controlled. At least one thermostat 26 in each area that requires temperature control is needed to communicate with the main controller. The thermostats could be either wired to the main controller or completely wireless. In a wireless system, each of the systems will include a wireless adapter. It is to be noted that the power requirements for the system could be provided by the building electricity via wires or, locally, through batteries.

In a further embodiment of the present invention, as shown in Figure 4, the invention comprises a wireless central control system 30 which can be configured to be controlled by a wireless controller. In this embodiment, the controller can be situated at a central location within a house or building. Thermostats 32 situated in each room can send temperature signals to the controller. Based upon a preprogrammed temperature profile for each room, the controller will send out signals to the vent control motor in each room to be controlled. The vent motors 34 will then open or close the vents 36 as required. Such a system could be configured to be activated by a cell phone, wireless device, PDA, PALM Pilot. The controller of both embodiments can be configured to switch between air conditioning and heat as the need arises.

The present invention suggests a large number of alternative embodiments which utilize automatic vents to control different areas

temperatures to add comfort and to save energy. For example, the present invention suggests a kit which could be sold in stores and retrofitted onto existing systems. Such a kit could include the requisite controller, a plurality of thermostats and vent control mechanisms. In addition, it is to be appreciated that the controller itself, rather than be an independent unit, could be a module within a PC, Laptop or PDA.

The present invention has been described with reference to the above detailed description. The true nature and scope of the invention should be determined with reference to the claims appended hereto